DEPARTMENT OF THE NAVY
BASE REALIGNMENT AND CLOSURE
PROGRAM MANAGEMENT OFFICE
1455 FRAZEE RD, SUITE 900
SAN DIEGO, CA 92108-4310

5090
Ser BPMOW.mos/1509
22 Dec 05

Ms. Patricia Hannon
California Regional Water Quality Control Board
California Tower
3737 Main Street, Suite 500
Riverside, CA 92501-3339

Dear Ms. Hannon:

Enclosure (1) is the Draft Work Plan for Delineation of the Downgradient Methyl Tertiary Butyl Ether (MTBE) Plume for Underground Storage Tank Site 222, Former Gas Station, Former Marine Corps Air Station Tustin, California. This work plan has been prepared to expeditiously investigate the MTBE concentrations in this area of the plume. The Navy discussed the general approach for sampling with you in a telephone call on Tuesday, 22 November 2005 and your comments have been incorporated into the draft work plan.

The Navy requests an expedited review to ensure the fieldwork can be conducted in January 2006 and the preliminary results can be presented to the public at the Restoration Advisory Board (RAB) meeting in February 2006. Please submit your comments, of any, by **Friday, January 6, 2006**.

If you have any questions about this document, please contact Mr. Marc P. Smits at (619) 532-0793 or me at (619) 532-0963.

Sincerely,

DARREN NEWTON
BRAC Environmental Coordinator
By direction of the Director

Enclosure: 1. Draft Work Plan for Delineation of the Downgradient Methyl Tertiary Butyl Ether Plume for Underground Storage Tank Site 222, Former Marine Corps Air Station Tustin, California dated December 2005

5090
Ser BPMOW.mos/1509
22 Dec 05

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DRAFT WORK PLAN
for
Delineation of the Downgradient Methyl Tertiary Butyl Ether Plume
For Underground Storage Tank Site 222
Former Marine Corps Air Station Tustin, California

Contract No. N68711-01-D-6009
Task Order No. 0012
Modification No. 02

Prepared for:

Naval Facilities Engineering Command
Southwest Division
1220 Pacific Highway
San Diego, CA 92132

Prepared by:

Battelle
The Business of Innovation

Environmental Restoration Department
505 King Avenue
Columbus, Ohio 43201

December 21, 2005

The vendors and products, including the equipment, system components, and other materials identified in this report, are primarily for information purposes only. Although Battelle may have used some of these vendors and products in the past, mention in this report does not constitute Battelle's recommendation for using these vendors or products.

APPROVAL PAGE

DRAFT WORK PLAN

for

Delineation of the Downgradient Methyl Tertiary Butyl Ether Plume
For Underground Storage Tank Site 222
Former Marine Corps Air Station Tustin, California

Contract No. N68711-01-D-6009
Task Order No. 0012
Modification No. 02

Battelle Project Manager: ______________________________ Date: 12-21-05
Nick Amini, Ph.D., P.E.

SWDIV Remedial Project Manager: ______________________________ Date: __________
Mr. Marc P. Smits

DISTRIBUTION LIST

The following persons will be provided copies of the approved Work Plan and any subsequent revisions.

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CONTENTS

FIGURES

APPENDICES

ABBREVIATIONS AND ACRONYMS

bgs	below ground surface
CPT	cone-penetrometer testing
GPR	ground penetrating radar
MCAS	Marine Corps Air Station
MTBE	methyl-*tert*-butyl ether
NAVFAC	Naval Facilities Engineering Command
PCAP	Petroleum Corrective Action Plan
RWQCB	Regional Water Quality Control Board
SOW	statement of work
SWDIV	Southwest Division Naval Facilities Engineering Command
TBA	*tertiary*-butyl alcohol
TBF	*tertiary*-butyl formate
TCE	trichloroethylene
TCP	trichloropropane
TPH	total petroleum hydrocarbons
U.S. EPA	United States Environmental Protection Agency
UST	underground storage tank
VOC	volatile organic compound
WBZ	water-bearing zone

SECTION 1.0: INTRODUCTION

This Work Plan has been prepared to support work to be performed by Battelle for the Naval Facilities Engineering Command (NAVFAC) Southwest Division under Contract No. N68711-01-D-6009, Task Order No. 012, Modification 002 at Former Marine Corps Air Station (MCAS) Tustin, California. This Work Plan has been prepared for the delineation of the leading edge of the methyl tertiary butyl ether (MTBE) plume which will include performing sampling and analysis of groundwater near the Navy property boundary. On November 10, 2005, Battelle received a Statement of Work (SOW) requesting that Battelle submit a proposal for preparing a work plan and delineating the downgradient, leading edge of the MTBE plume at Underground Storage Tank (UST) Site 222. Procedures used during the delineation will follow the Sampling and Analysis Plan (Appendix A) and a Site Health and Safety Plan (Appendix B).

1.1 Objectives.

The objectives of the field effort described in this work plan are as follows:

- Identify the horizontal distribution of MTBE plume near the MCAS Tustin carve-out 5 boundary
- Identify the vertical distribution of the MTBE plume in the 2nd and 3rd water- bearing zones (WBZs) near the carve-out boundary
- Identify if additional delineation is required
- Verify the subsurface geology in the area including the lithology, thickness of the water-bearing zones and depth to water
- Determine the necessity of a second phase of investigation based on the results from this phase
- Gather data to be used in designing/locating additional monitoring wells in the downgradient portion of the MTBE plume.

1.2 Approach.

This investigation will be conducted as a part of a more comprehensive approach that entails containment and removal of the UST Site 222 MTBE plume in the northeastern portion of the station (also known as Petroleum Corrective Action Plan). Based on the data currently available, the leading edge of the MTBE plume may be approaching the CO-5 boundary. Since the land located beyond the station boundary is not the property of the U.S. Navy, there is a requirement to launch an immediate investigation to verify the horizontal and vertical distribution of the leading edge of the plume (Phase I investigation). The data collected from the delineation activities will be evaluated in coordination with the Regional Water Quality Control Board to determine if further delineation is necessary (Phase II investigation).

The ultimate goal for these investigations is to provide an inclusive field of information to shape and refine the larger approach for the final PCAP for UST Site 222. The results from these investigations will have direct influence on the final selection of the remedy at this site. Depending on the location and concentration of the MTBE plume and the resulted urgency for its containment or removal, the proposed treatment alternative may have to be reevaluated or modified to include the new definition of the plume and its associated environmental risk. The data gathered during this investigation is necessary to ensure proper design of the final PCAP cleanup for MTBE. This data may also be used to support fate and transport modeling in a future effort. No modeling will be performed under the current task.

1.3 Report Organization.

This Work Plan is divided into sections that describe the key components of the delineation associated with this delivery order modification. Section 1.0 provides an introduction to the project and the site. Section 2.0 describes the site background. Section 3.0 describes the delineation activities that will be performed at the Navy property boundary. Section 4.0 provides the references cited throughout the document.

SECTION 2.0: UNDERGROUND STORAGE TANK (UST) SITE 222 BACKGROUND

This section provides a general description and historical information for the UST Site 222 at Former MCAS Tustin.

2.1 General Site Description.

The former MCAS Tustin is located in Southern California, near the center of Orange County (Figure 2-1). The Base is approximately 40 miles south of downtown Los Angeles and 100 miles north of the California/Mexico border. The installation was established in the early 1940s to meet World War II military requirements and occupies approximately 1,600 acres of land. A large portion of the Base is located in the city of Tustin. The Base is bordered by the cities of Santa Ana and Irvine.

2.2 Cleanup History.

UST Site 222 is a former gasoline station located in the northwest portion of the Base, on McCain Smith Road. UST Site 222 consisted of four 12,000-gallon gasoline USTs, two 500-gallon motor oil USTs, one 500-gallon waste oil UST, several fuel dispensing islands, and Building 222, which was used to perform vehicle maintenance and service. The gas station was taken out of service in 1998. Soil removal activities were conducted in early 1998 to remove soil contaminated with total petroleum hydrocarbons and MTBE. Groundwater contamination of MTBE was treated with extraction wells to reduce the contaminant mass and contain the plumes horizontally and vertically. Groundwater was treated at a HiPOx™ treatment system.

Cleanup activities have been performed on soils and groundwater at the site. Multiple excavations have been conducted to address the contaminated soils, with the most recent excavation occurring in 2005. Therefore, a critical component of the remediation process, source soil remediation, has been completed. During excavation, groundwater within the excavated areas has been extracted and treated, addressing much of the dissolved MTBE mass near the release area.

Outside the source area, a groundwater extraction and treatment system has been installed. This system began operating in August 2001 and uses a HiPOx™ treatment to destroy the MTBE. Based on data in 2003 the system has removed more than 4,200 lb of MTBE. The HiPOx™ process developed by Applied Process Technology, Inc., is an Advanced Oxidation Process that uses the reaction of ozone and hydrogen peroxide to form hydroxyl radicals that subsequently destroy organic compounds in water. The degradation of the MTBE molecule with the use of the HiPOx™ technology follows a process where MTBE is degraded to *tert*-butyl formate (TBF) and then to acetone. The final products are carbon dioxide and water.

Quarterly groundwater monitoring at former MCAS Tustin was initiated in 1995 as part of a remedial investigation/feasibility study (RI/FS). MTBE has been detected in the second WBZ in newly constructed groundwater monitoring wells IS72MW15D and IS72MW16D which are located downgradient of the groundwater extraction and treatment system and near the Navy property boundary. Figure 2-2 presents the MTBE plume based on the first and second groundwater sampling events of 2005.

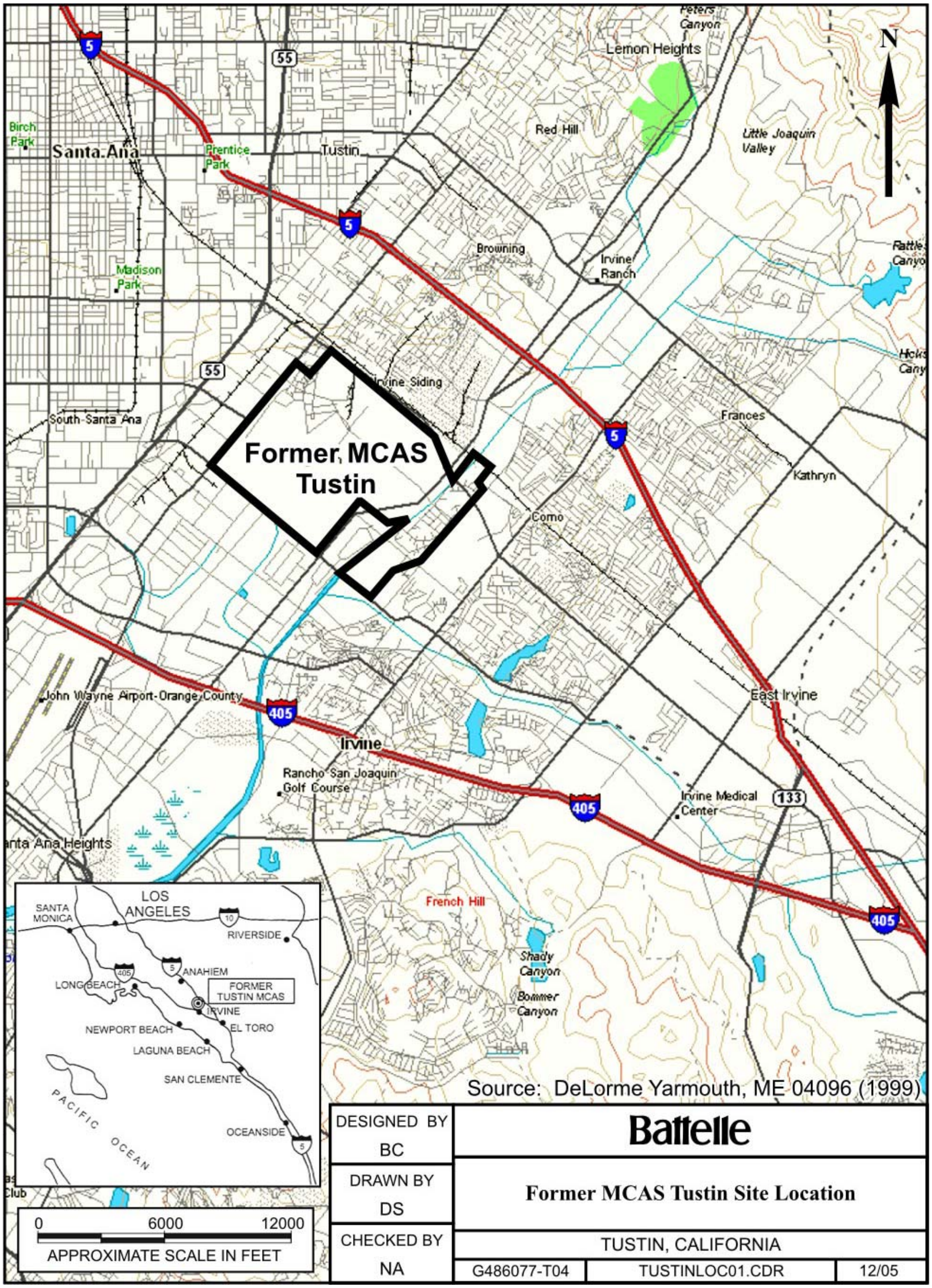

Figure 2-1. Former MCAS Tustin Site Location Map

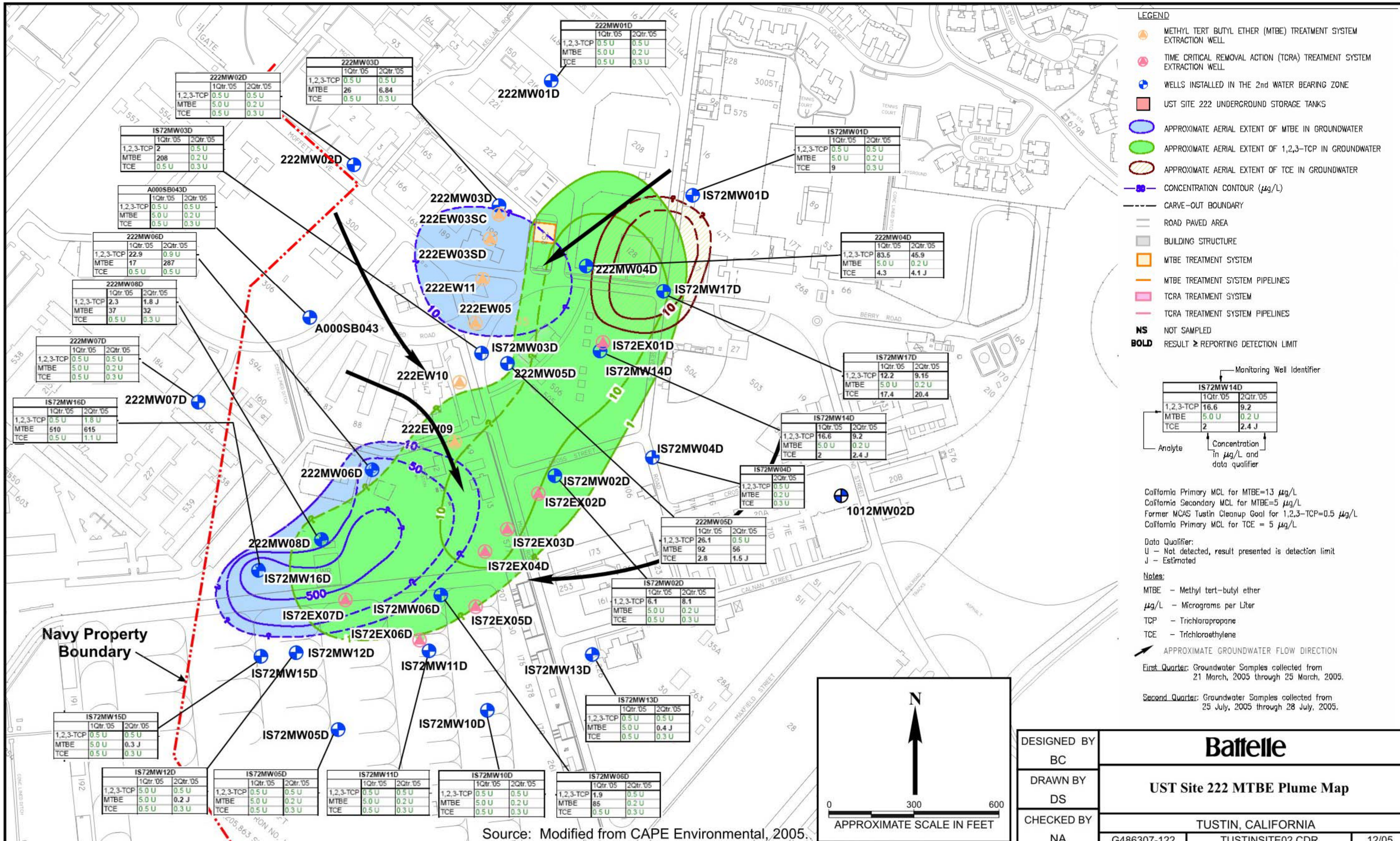

Figure 2-2. UST Site 222 MTBE Plume Map

SECTION 3.0: SITE ASSESSMENT AT PRIOR PW GAS STATION

MTBE was detected in monitoring well IS72MW16D at concentrations of 510 and 615 µg/L, respectively, during the first and second quarter 2005 groundwater sampling events at Former MCAS Tustin, CA. Well IS72MW16D is located downgradient of the Interim PCAP system at the UST Site 222 near the carve-out 5 (CO-5) property boundary. The objective of this delineation is to determine the MTBE concentrations in the groundwater in the second and third WBZs between the monitoring well IS72MW16D and the current Navy property boundary and to determine if the MTBE is migrating off the Navy property. An additional objective of the delineation activities is to determine that if MTBE is migrating off the Navy property, then do additional delineation activities need to be scheduled.

A geophysical survey will be conducted in the area near the leading edge of the MTBE plume for the purpose of utility location for the hydropunch and cone-penetrometer testing (CPT) activities. The geophysical survey will incorporate a variety of investigative techniques including a combination of electromagnetic induction, magnetometry, and ground penetrating radar (GPR). A utility locator with line tracing capabilities will also be brought to the field and used where risers exist, onto which a signal can be impressed and traced. Multiple methods will be utilized because each instrument senses different material properties of the ground and buried objects. The survey will be conducted by systematically free-traversing with multiple instruments within the immediate vicinity of the proposed sampling locations. In addition to the geophysical survey, Battelle will apply for utility clearances for the proposed sampling locations. The request for utility clearance will be submitted prior to the scheduled inception of CPT activities. Proposed sampling locations will be marked with stakes and/or marking paint.

Following the geophysical survey, Battelle will perform CPT and groundwater sampling at 15 locations. There will be one row of five CPT sample locations and an additional row of ten CPT sample locations. These locations were selected based on two quarterly groundwater sampling results of well IS72MW16D and the location of the Navy property boundary. CPT measurements will be used to delineate soil types and soil permeability. CPT drilling will be conducted to a total depth of 70 ft bgs (within the second WBZ) at 13 locations. The two centermost locations (Figure 3-1) will be extended to a total depth of 90 ft bgs into the third WBZ. Groundwater samples will be collected within the second WBZ at a depth of approximately 55 ft below ground surface (bgs) at each of the 15 locations. Additional groundwater samples will be collected within the third WBZ at 85 ft bgs at the two centermost locations (Figure 3-1).

The groundwater samples will be sent to a Navy-approved laboratory to be analyzed by United States Environmental Protection Agency (U.S. EPA) Method 8260 for volatile organic compounds (VOCs), including MTBE.

The MTBE concentrations in the second and third WBZs will be evaluated to determine if MTBE has migrated off the Navy property. If MTBE concentrations in the second and third WBZs are greater than 13 µg/L in the proposed CPT sample locations, then it is possible that MTBE is migrating off the Navy property; however, if MTBE is less than 13 µg/L in the second and third WBZs in the sample locations, then it is probable that MTBE is not migrating off the property.

The data will also be evaluated to see if additional delineation activities are needed. If MTBE concentrations in the second and third WBZs are greater than 44 µg/L, the additional delineation studies will be conducted in the future; however, if MTBE concentrations in the same WBZs are less than 13 µg/L, then there will be no further delineation activities. If the MTBE groundwater concentrations are between 13 µg/L and 44 µg/L in the second and third WBZs, then further delineation activities will be considered in consultation with the RWQCB. In any event, the subsurface geology information gathered during the investigation will be used to design and locate at least one groundwater monitoring well, to be installed in a future effort.

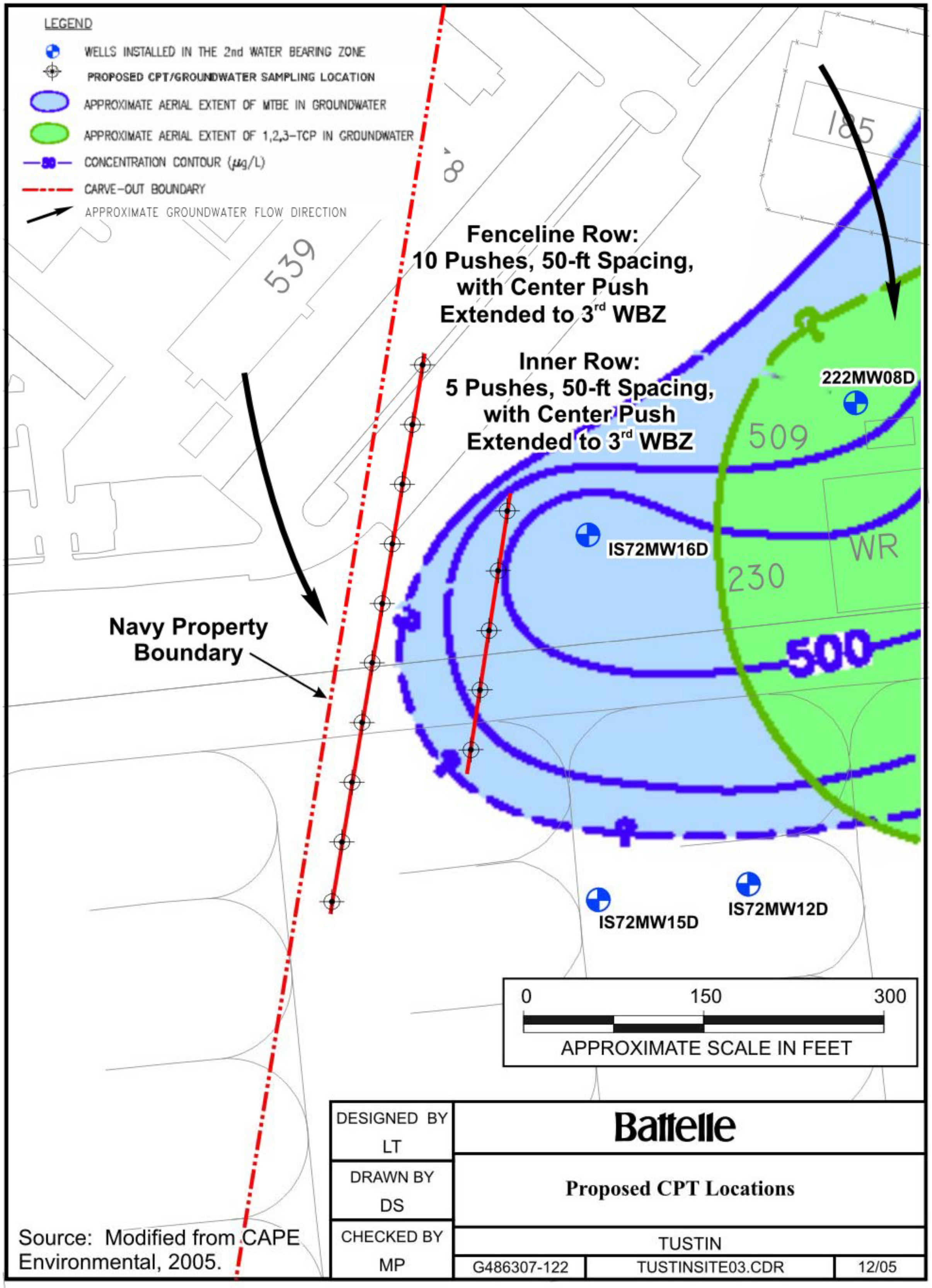

Figure 3-1. Proposed CPT Locations

SECTION 4.0: REFERENCES

Battelle. 2005. *Draft Health and Safety Plan for Development and Implementation of a Final Petroleum Corrective Action Plan for Underground Storage Tank Site 222 at Former Marine Corps Air Station Tustin, California.* November.

CAPE Environmental. 2005. *Quarterly Groundwater Progress Monitoring Data Summary Operable Unit 1A (IRP-13S) and UST Site 222, Second Quarter 2005, Former Marine Corps Air Station Tustin, California.* Project number 26003.005.204. October.

Shaw Environmental. 2005. *Draft Addendum to the Final Interim Petroleum Corrective Action Plan, MTBE Groundwater Extraction and Treatment System, Phase 1 and Phase 2*, July.

Shaw Environmental. 2005. *Draft 2004 Annual System Performance Report, PCAP Groundwater Extraction/Treatment System,* July.

DRAFT
SAMPLING AND ANALYSIS PLAN
(FIELD SAMPLING PLAN/QUALITY ASSURANCE PROJECT PLAN)

For

Delineation of the Downgradient Methyl Tertiary Butyl Ether Plume
For Underground Storage Tank Site 222
Former Marine Corps Air Station Tustin, California

Contract No. N68711-01-D-6009
Task Order No. 0012
Modification No. 02

Prepared for

Naval Facilities Engineering Command
Southwest Division
1220 Pacific Highway
San Diego, CA 92132

Prepared by:

Battelle
Environmental Restoration Department
505 King Avenue
Columbus, Ohio 43201

December 22, 2005

DRAFT

SAMPLING AND ANALYSIS PLAN
(FIELD SAMPLING PLAN/QUALITY ASSURANCE PROJECT PLAN)

For

Delineation of the Downgradient Methyl Tertiary Butyl Ether Plume
For Underground Storage Tank Site 222
Former Marine Corps Air Station Tustin, California

Contract No. N68711-01-D-6009
Task Order No. 0012
Modification No. 02

December 21, 2005

Battelle Project Manager:	Nick Amini, Ph.D., P.E.	Date: 12-21-05
Battelle Program QC Manager:	Ms. Betsy Cutié	Date: 12/20/05
NAVFAC Southwest QA Officer	Mr. Narciso Ancog	Date: 12/22/05

CONTENTS

FIGURES

TABLES

ABBREVIATIONS AND ACRONYMS

AB	Assembly Bill
bgs	below ground surface
CFR	Code of Federal Regulations
CO	carve-out
CPT	cone penetrometer testing
DI	deionized
DHS	(California) Department of Health Services
DQO	data quality objective
GC	gas chromatography
GC/MS	gas chromatography/mass spectrometry
HPLC	high-performance liquid chromatography
IATA	International Air Transportation Association
ID	identification
IDW	investigation-derived waste
IRCDQM	Installation Restoration Chemical Data Quality Manual
LCS	laboratory control standard
LCSD	laboratory control sample duplicate
LQAP	Laboratory Quality Assurance Plan
MCAS	Marine Corps Air Station
MDL	method detection limit
MS	matrix spike
MSD	matrix spike duplicate
MS/MSD	matrix spike/matrix spike duplicate
MTBE	methyl-*tert*-butyl ether
NAVFAC	Naval Facilities Engineering Command
ND	not detected
NEDD	Naval Electronic Data Deliverable
NELAC	National Environmental Laboratory Accreditation Conference
NFESC	Naval Facilities Engineering Service Center
NIRIS	Navy Installation Restoration Information System
NIST	National Institute of Standards and Technology
NPL	National Priorities List
OSHA	Occupational Safety and Health Administration
PE	performance evaluation
PCAP	Petroleum Corrective Action Plan
PPE	personal protective equipment

ABBREVIATIONS AND ACRONYMS (Continued)

QA	quality assurance
QA/QC	quality assurance/quality control
QAO	quality assurance officer
QC	quality control
RAB	Restoration Advisory board
RL	reporting limit
RPD	relative percent difference
RPM	Remedial Project Manager
RSD	relative standard deviation
RWQCB	Regional Water Quality Control Board
SAP	Sampling and Analysis Plan
SHSO	Site Health and Safety Plan
SHSP	Site Health and Safety Plan
SIS	surrogate internal standard
SOP	standard operating procedure
SWRCB	State Water Resources Control Board
TBA	*tert*-butyl alcohol
TCP	trichloropropane
TSA	Technical Systems Audit
U.S. EPA	United States Environmental Protection Agency
UST	underground storage tank
VOA	volatile organic analysis
VOC	volatile organic compound
WBZ	water-bearing zone

DISTRIBUTION LIST

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Table A-1. Elements of U.S. EPA QA/R-5 in Relation to this Sampling and Analysis Plan

U.S. EPA QA/R-5 QAPP ELEMENT		Battelle SAP
A1	Title and Approval Sheet	Section 1.1 Title and Approval Page
A2	Table of Contents	Section 1.2 Table of Contents
A3	Distribution List	Section 1.3 Distribution List
A4	Project/Task Organization	Section 1.4 Project Organization and Responsibilities
A5	Problem Definition/Background	Section 1.5 Problem Definition/Background
A6	Project/Task Description	Section 1.6 Project/Task Description
A7	Quality Objectives and Criteria	Section 1.7 Quality Objectives and Criteria
A8	Special Training/Certification	Section 1.8 Special Training and Certification
A9	Documents and Records	Section 1.9 Documentation and Records
B1	Sampling Process Design	Section 2.1 Sampling Process Design
B2	Sampling Methods	Section 2.2 Sampling Methods
B3	Sample Handling and Custody	Section 2.3 Sample Handling and Custody
B4	Analytical Methods	Section 2.4 Analytical Methods
B5	Quality Control	Section 2.5 Quality Control
B6	Instrument/Equipment Testing, Inspection, and Maintenance	Section 2.6 Instrument/Equipment Testing, Inspection, and Maintenance
B7	Instrument/Equipment Calibration and Frequency	Section 2.7 Instrument/Equipment Calibration Procedures and Frequency
B8	Inspection/Acceptance of Supplies and Consumables	Section 2.8 Inspection/Acceptance of Supplies and Consumables
B9	Nondirect Measurements	Section 2.9 Nondirect Data Measurements
B10	Data Management	Section 2.10 Data Management
C1	Assessment and Response Actions	Section 3.1 Assessments and Response Actions
C2	Reports to Management	Section 3.2 Reports to Management
D1	Data Review, Verification, and Validation	Section 4.1 Data Review, Verification, and Validation
D2	Verification and Validation Methods	Section 4.2 Verification and Validation Methods
D3	Reconciliation with User Requirements	Section 4.3 Reconciliation with Data Quality Objectives

Section 1.0: PROJECT MANAGEMENT

This Sampling and Analysis Plan (SAP) has been prepared to support the work to be performed by Battelle for the Naval Facilities Engineering Command (NAVFAC) Southwest Division under Contract No. N68711-01-D-6009, Task Order No. 0012, Modification 02 at Former Marine Corps Air Station (MCAS) Tustin, CA. The SAP describes the objectives and locations of sampling activities, as well as field methods and procedures. It also describes project management, design and implementation of measurement systems, assessment/oversight of quality assurance/quality control (QA/QC) issues, data validation, and QA/QC protocols necessary to achieve data quality objectives (DQOs). This SAP also describes the procedures for collecting and analyzing groundwater samples in support of delineation activities at Former MCAS Tustin.

The objectives of this SAP are to provide a rationale for field sampling activities at the project areas, describe and establish consistent field sampling procedures, and establish data gathering, handling, and documentation methods that are precise, accurate, representative, complete, and comparable to meet the quality control (QC) requirements for the project and the DQOs. The information collected will be used to accomplish the following:

- Conduct field activities at the Former MCAS Tustin to delineate the leading edge of the methyl tertiary butyl ether (MTBE) plume, and determine if the plume has migrated off Navy property.

The information presented in this SAP is organized into four groups according to function and are based on *EPA Requirements for Quality Assurance Project Plans* (U.S. EPA, 2001) as follows:

A. Project Management – this group is divided into elements that describe general areas of project management, project history and objectives, and roles and responsibilities of the participants.

B. Data Generation and Acquisition – this group is divided into elements that describe the experimental design, sampling and analytical methods, sample handling, and QC requirements.

C. Assessment and Oversight – this group is divided into elements that describe activities for assessing the effectiveness of sample collection and analysis and associated QA/QC requirements.

D. Data Validation and Usability – this group is divided into elements that describe quality assurance (QA) activities that occur after the data generation and acquisition phase of the project has been completed to ensure that data conform to the specified criteria and thus are useful for their intended purpose.

1.1 Title and Approval Page (A1)

The SAP Project Title and Approval sheet is provided as page ii of the SAP.

1.2 Table of Contents (A2)

The SAP Table of Contents is presented beginning on page iii of the SAP.

1.3 Distribution List (A3)

The SAP Distribution List is presented on page vii of the SAP.

1.4 Project Organization and Responsibilities (A4)

Figure 1-1 provides a project organization chart for the delineation activities at Former MCAS Tustin. Key personnel shown in the chart include the Navy Remedial Project Manager (RPM), Navy Quality Assurance Officer (QAO), Battelle Project Manager, Battelle Program QC Manager, and the Battelle Project Team. Key subcontracted services are anticipated to include the following: analytical laboratories for analysis of water samples; subsurface utility locator for locating subsurface utilities; driller for cone penetrometer testing (CPT) and collection of groundwater samples; and waste collection services. Key roles and responsibilities for technical staff associated with the work outlined in this SAP are presented in the Distribution Table, which includes contact e-mail addresses and telephone numbers for staff members.

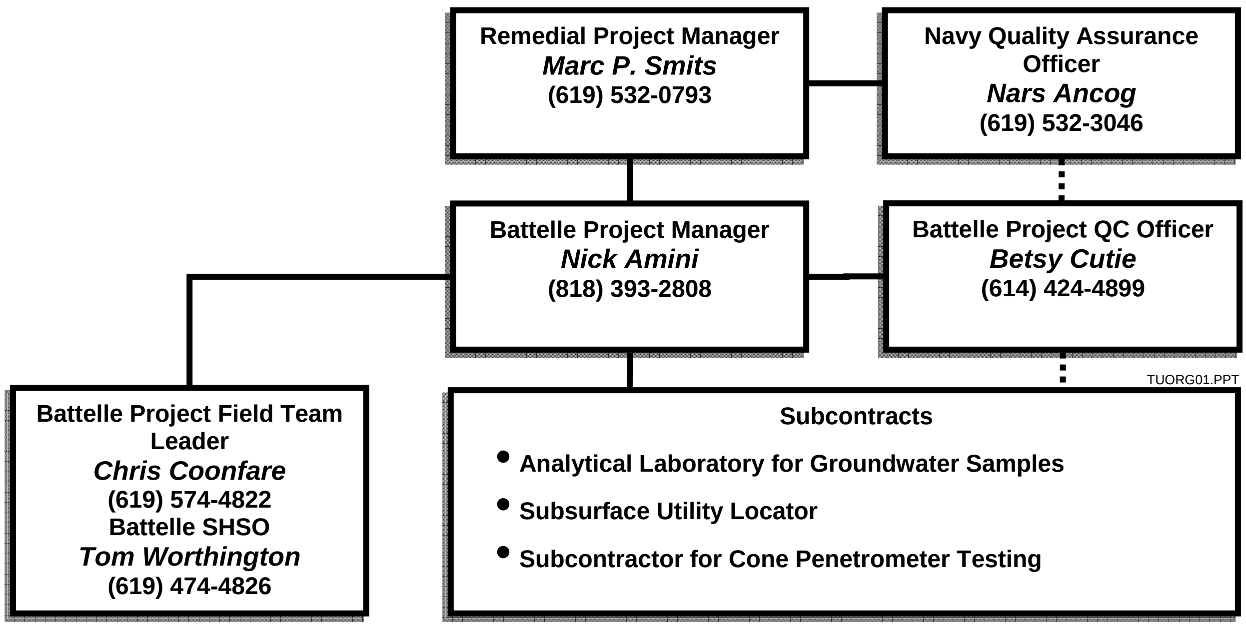

Figure 1-1. Project Organization Chart

1.5 Problem Definition/Background (A5)

MTBE was detected in monitoring well IS72MW16D at concentrations of 510 and 615 µg/L, respectively, during the first and second quarter 2005 groundwater sampling events at Former MCAS Tustin, CA. Well IS72MW16D is located downgradient of the Interim Petroleum Corrective Action Plan (PCAP) system at the underground storage tank (UST) Site 222, near the carve-out 5 (CO-5) property boundary.

The Regional Water Quality Control Board (RWQCB), Santa Ana Region, has identified the delineation of the plume as a priority to evaluate the extent of the plume in relation to the Navy property boundary. The delineation will be limited to the known extent of the downgradient portion of the plume and the Navy property boundary. The intent of the delineation activities is to determine if the MTBE plume has extended beyond the Navy property boundary. Results from this investigation will be helpful in developing the Final PCAP for UST Site 222.

Table 1-1. Project Personnel and Project Responsibilities

Position	Responsibilities	Authority
Navy QA Officer **Narciso Ancog**	• Oversight of QA issues for entire program • Review and approval of SAP, and all other QA/QC documents • Review of design process • Communication with Battelle Program QC Manager • Communication of issues to the Navy RPM	• Authorized to suspend field activities if QA requirements are not met
Navy RPM **Marc P. Smits**	• Final approval for conducting all field activities • Oversight of the overall Task Order 0012 • Execution of contracts • Approval of the release of study reports • Oversight of field and analytical activities	• Authorized to suspend work for cause if data quality or staff safety are threatened
Battelle Program Manager **Keith Fields**	• Management of Task Order 0012 contract • Assignment of personnel • Monitoring and control of cost, schedule, and QC • Compliance with regulations • Management of subcontractors • Liaison with CO/COR	• Authorized to suspend work for cause if data quality or staff safety are threatened
Battelle Project Manager **Nick Amini**	• Management of budget and scheduling • Development of engineering design • Development of SAP and SHSP • Management of the field team • Reporting and planning • Navy requirements • Recommendation/justification for change order • Coordination of subcontractor work	• Allocate budget • Approve all labor, materials, equipment, and subcontractor charges to the project • Assign technical and operational staff to the project • Approve all technical deliverables, including the SAP
Battelle Program QC Manager **Betsy Cutié**	• Approval of QA/QC requirements • Review of data • Coordination of data validation • Interaction with Navy QA Officer	• Authorized to suspend work for cause if data quality is threatened
Battelle Site Health and Safety Officer (SHSO) **Tom Worthington**	• Review of the project SHSP • Ensuring that the field personnel have received appropriate health and safety training for project work • Obtaining all safety training documents for field personnel	• Authorized to suspend work if staff safety is threatened
Battelle Field Team Leader **Chris Coonfare**	• Performance of all sampling in accordance with the approved SAP • Calibration and maintenance of field measurement equipment • Completion of field documentation • Coordination of laboratory and field sampling activities • Implementation of field corrective actions as required	• Initiate corrective action

Table 1-1. Project Personnel and Project Responsibilities (Continued)

Position	Responsibilities	Authority
EMAX Laboratory	• Maintenance of sample chain of custody • Ensure that only staff trained according to the SAP work on the projects • Implementation of the requirements of the SAP for sample analysis, instrument calibration, and data reporting • Conduct corrective action for all failed QC, including reanalysis • Maintenance of documentation sufficient to provide full data traceability • Archive samples and data according to the SAP retention policy • Contact the Project Manager when deviations that could affect data quality are identified	• Assign laboratory personnel • Implement corrective action • Report analytical results to Battelle

1.6 Project/Task Description (A6)

The purpose of the activities at Former MCAS Tustin is to utilize hydropunch and CPT testing technology to collect groundwater samples and soil logging data for evaluation to further delineate the leading edge of the MTBE plume. Samples will be collected from within the second and third water-bearing zones (WBZs) to evaluate whether the MTBE plume extends beyond the Navy property boundary and/or has potentially migrated downward into the third WBZ.

1.7 Quality Objectives and Criteria for Measurement Data (A7)

This section presents the DQOs for the project and the performance criteria necessary to meet these DQOs. Included are discussions of the project DQOs, quantitative DQOs (precision, accuracy, and completeness), and qualitative DQOs (comparability and representativeness). The overall QC objective is to generate data that are of known documented, and defensible quality.

1.7.1 Data Quality Objectives. DQOs are statements that specify the quantity and quality of the data required to support project decisions. DQOs were developed for this project using the seven-step process listed in *Data Quality Objectives Process for Hazardous Waste Site Investigations* (U.S. EPA, 2000). The DQOs are presented in Table 1-2. The QC procedures as well as the associated field sampling procedures for each project will be focused on achieving these DQOs in a timely, cost-effective, and safe manner. Deviations from the DQOs will require defining the cause or causes for noncompliance and will initiate the process of determing whether additional sampling and analyses will be required to attain project goals.

1.7.2 Quantitative Objectives: Precision, Accuracy, and Completeness. Precision quantifies the repeatability of a given measurement. Precision is estimated by calculating the relative percent difference (RPD) of field duplicates, as shown in the following equation:

$$\text{RPD}\,(\%) = \frac{\left|\text{Result - Duplicate Result}\right|}{\left(\text{Result} + \text{Duplicate Result}\right)/2} \times 100\%$$

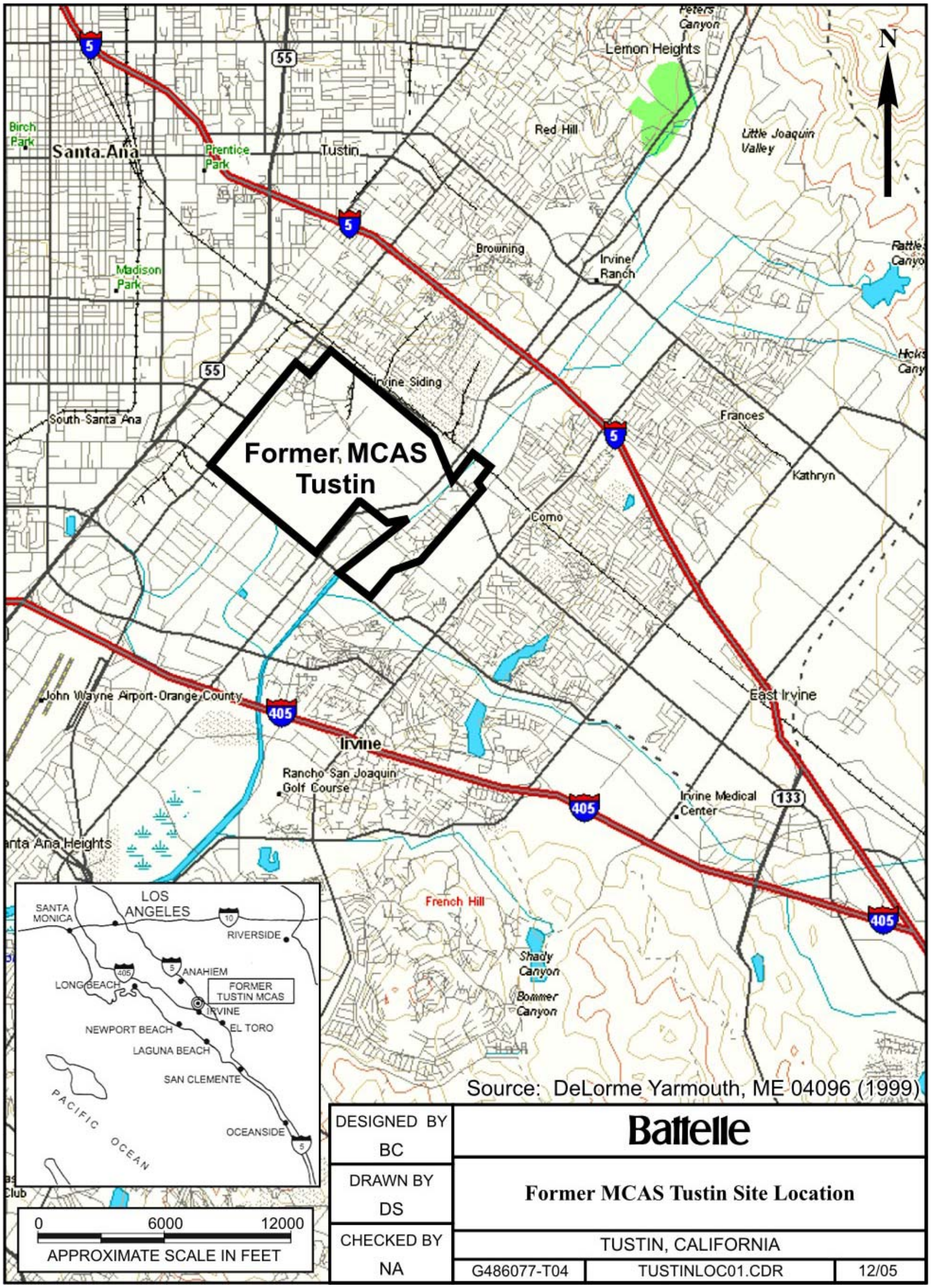

Figure 1-2. Former MCAS Tustin Site Location

The laboratory will review the QC samples to ensure that internal QC data lies within the limits of acceptability. Any suspect trends will be investigated and corrective actions taken.

Accuracy refers to the percentage of a known amount of analyte recovered from a given matrix. Percent recoveries are estimated using the following equation and can be calculated for the project-specific matrix (i.e., water, solids and air).

$$\begin{matrix}\text{Recovery Laboratory Control Standard (LCS)} \\ \text{and Surrogate Internal Standard (SIS) (\%)}\end{matrix} = \frac{\text{Amount Spike Recovered}}{\text{Amount Spike Added}} \times 100$$

$$\begin{matrix}\text{Recovery Matrix Spike/Matrix} \\ \text{Spike Duplicate (MS/MSD) (\%)}\end{matrix} = \frac{(\text{Spiked Sample Result}) - (\text{Sample Result})}{(\text{Spike Added})} \times 100$$

Completeness refers to the percentage of valid data received from actual testing done in the laboratory. Completeness is calculated as shown in the following equation. The target completeness goal for all compounds is 90%. The goal for holding times will be 100%.

$$\text{Completeness (\%)} = \frac{\text{Number of Measurements Judged Valid}}{\text{Total Number of Measurements}} \times 100$$

1.7.3 Qualitative Objectives: Comparability and Representativeness. Comparability is the degree to which one data set can be compared to another. To ensure comparability, samples will be collected at specified intervals and in a similar manner, and will be analyzed within the required holding times by accepted and comparable methods. All data and units used in reporting for this project will be consistent with accepted conventions for environmental matrix analyses. This approach will ensure direct comparability between the results from this project and the results from other projects using the methods presented in this SAP.

Representativeness is the degree to which a sample or group of samples is indicative of the population being studied. Over the course of a project, samples will be collected in a manner such that they are representative of both the chemical composition and the physical state of the sample at the time of sampling.

1.8 Special Training/Certification (A8)

All personnel performing fieldwork must comply with Occupational Safety and Health Administration (OSHA) requirements as specified in 29 Code of Federal Regulations (CFR) 1910. Additional health and safety training requirements for this project can be found in the Site Health and Safety Plan (SHSP), Appendix B of the work plan.

Field team members will be adequately trained in field methods and sampling procedures outlined in this plan. Specifically, field team members will have training in the following field activities: CPT rig/direct push; well inspection; groundwater sampling; use of water-level indicators, peristaltic pumps, and related field equipment; sample handling, packaging, and shipping; and handling of investigation-derived waste (IDW).

Table 1-2. Data Quality Objectives for Leading Edge MTBE Delineation for Former MCAS Tustin

STEP 1 State the Problem	STEP 2 Identify the Decisions (Questions)	STEP 3 Identify the Inputs to the Decisions	STEP 4 Define Study Boundaries	STEP 5 Develop Decision Rules	STEP 6 Evaluate Decision Errors	STEP 7 Describe the Sampling Design
MTBE was detected in monitoring well IS72MW16D at concentrations of 510 and 615 µg/L, respectively, during the first and second quarter 2005 groundwater sampling events at Former MCAS Tustin, CA. Well IS72MW16D is located downgradient of the Interim Petroleum Corrective Action Plan (PCAP) system at the UST 222 Site, near the carve-out 5 (CO-5) property boundary. There is an immediate need to delineate the MTBE-contaminated groundwater to determine if it is migrating off-site.	Q1. Do concentrations of MTBE in the 2nd and 3rd waterbearing zones between monitoring well IS72MW16D and the current Navy property boundary (CO-5) suggest that MTBE may be migrating off the Navy property?" Q2. What is the optimum location for a new monitoring well (to be installed during a future mobilization) near the Navy property boundary?	Valid analytical results from the groundwater samples taken from the second and third water-bearing zones and analyzed for VOCs (EPA SW-846 8260B) including MTBE. Analytical detection limits for MTBE need to be less than 13 µg/L. Descriptions of the subsurface lithology, including soil types, depth to groundwater, and presence/thickness of the WBZs in the area of investigation.	The groundwater investigation will focus on the leading edge of the MTBE-contaminated groundwater. The area of focus will be between groundwater monitoring well IS72MW16D and the CO-5 boundary. The southern limit will be well IS72MW15D and IS72MW12D, in which MTBE was not detected in the first quarter and was detected at estimated values less than 1 µg/L in the second quarter of 2005. The investigation will be focused vertically between the ground surface and the bottom of the 3rd WBZ, at approximately 90 ft below ground surface. Due to the public interest in this investigation, plans are to conduct fieldwork and obtain preliminary results prior to the February 2006 Restoration Advisory Board (RAB) meeting in order to provide an update to the public. There are no other temporal boundaries for the project. This study is considered the initial phase of investigation in the study area. Further delineation, if required, and monitoring well installation will be performed under future efforts.	DR1. If MTBE groundwater concentrations in the second and third water bearing- zones are greater than the action limit of 13 ug/L in the sample locations along the Navy property fenceline, then it is possible that MTBE above the action level is migrating off the Navy property. If MTBE groundwater concentrations in the second and third water bearing-zones are less than the action limit of 13 ug/L in the sample locations near the Navy property fenceline, then it is probable that MTBE above the action limit is not migrating off the property and there will be no further delineation activities. If the MTBE groundwater concentrations in the second or third water bearing zones are between 13µg/L and 44 µg/L, then further delineation activities will be considered in consultation with the RWQCB. If the groundwater concentrations of MTBE in the second and third water-bearing zones are greater than 44 µg/L, then additional delineation activities will be performed. DR2. The data gathered during the investigation will be used to design and locate at least one groundwater monitoring well (to be installed during a future mobilization) adjacent to the Navy property boundary. The location will be based on the groundwater sampling and cone penetrometer testing results from the delineation activities. The subsurface geology will be used to determine the screening depth of the groundwater monitoring well to best represent the groundwater at the site.	The nature of field investigations lends itself to uncertainties and data are being collected on a judgmental basis, thus limits on decision errors cannot be quantified. However, potential errors that may be encountered in the field can be mitigated through the use of established sampling procedures. To ensure usability of laboratory data, an EPA approved method has been selected to provide detection limits that allow comparison of the data to action levels. It is possible that contaminants are present in areas not sampled yielding false negative results. The sampling design was developed to minimize the chance of false negatives by using the best available knowledge of the site to focus the sampling on the areas most likely to contain contaminants.	Inner Row: • 5 sample locations • approximate 50 ft spacing • all locations will be sampled at the 2nd water-bearing zone • a sample will be collected in the 3rd water-bearing zone at the center location Fenceline Row: • 10 sample locations • approximate 50-ft spacing • all locations will be sampled at the 2nd water-bearing zone • a sample will be collected in the 3rd water-bearing zone at one of the center locations All groundwater samples will be analyzed for VOCs using analytical method EPA SW-846 8260B including MTBE. Soil data will be gathered using cone penetrometer testing (CPT) technology.

1.9 Documentation and Records (A9)

The following general types of documents and records will be maintained for this project:

- Work Plan
- SAP
- SHSP
- Project logbooks
- Chain-of-custody forms
- General project correspondence
- Laboratory data reports
- Data validation reports
- Sampling and analysis reports.

The Project Manager is responsible for maintaining the above records to meet the requirements of this SAP. This requirement includes the maintenance of all records and data necessary for QC reports to management, corrective actions, and other associated documentation. Project documentation will be maintained for a minimum of 10 years following completion of the project.

Section 2.0: FIELD SAMPLING PLAN (DATA GENERATION AND ACQUISITION)

The following sections describe the field activities that will be performed as part of the delineation of the downgradient MTBE plume at UST Site 222 at Former MCAS Tustin. Figure 2-1 presents the MTBE plume at UST Site 222. These activities include CPT to delineate soil types and soil permeability and collection of groundwater samples to better delineate the MTBE plume. Fifteen locations have been selected for CPT pushes. Groundwater will be sampled from the second water bearing zone at all 15 locations. Additional groundwater samples will be collected from the third WBZ at two locations.

2.1 Sampling Process Design (Experimental Design) (B1)

Battelle will subcontract a utility locating company to perform a geophysical survey in the area near the leading edge of the MTBE plume, utilizing ground-penetrating radar, electromagnetic induction, magnetometry, and other nonintrusive investigative technologies. The survey will serve the purpose of utility location for the CPT boring and groundwater sampling. In addition to the geophysical survey, Battelle will apply for utility clearances for the proposed sampling locations. The request for utility clearance will be submitted prior to the scheduled inception of CPT activities. Proposed sampling locations will be marked with stakes and/or marking paint.

Following the geophysical survey, Battelle will perform CPT and groundwater sampling at 15 locations. These locations were selected based on the results from two quarterly groundwater sampling events in 2005 which showed high MTBE concentrations in monitoring well IS72MW16D, located downgradient of the UST Site 222 Interim PCAP system. The sample locations are located between IS72MW16D and the Navy property boundary. Figure 2-2 presents the sampling locations for CPT and the groundwater sampling effort. The proposed sampling locations are in two rows: a row of 10 locations near the CO-5 boundary, and a row of 5 locations nearer to well IS72MW16D. The sample locations will be spaced approximately 50 ft apart in each of the two rows. CPT measurements will be used to delineate soil types and soil permeability. Concrete coring may be required at up to six locations prior to CPT boring activities. CPT boring will be conducted to a total depth of 70 ft bgs (within the second WBZ) at 13 locations. In each row, the centermost location (Figure 2-2) will be extended to a total depth of 90 ft bgs, into the third WBZ (total of two samples). Groundwater samples will be collected within the second WBZ at a depth of approximately 55 ft below ground surface (bgs) at each of the 15 locations. Additional groundwater samples will be collected within the third WBZ at approximately 85 ft. bgs at the two centermost locations (Figure 2-2). CPT data will be used to determine the exact groundwater sampling depth(s) at each location.

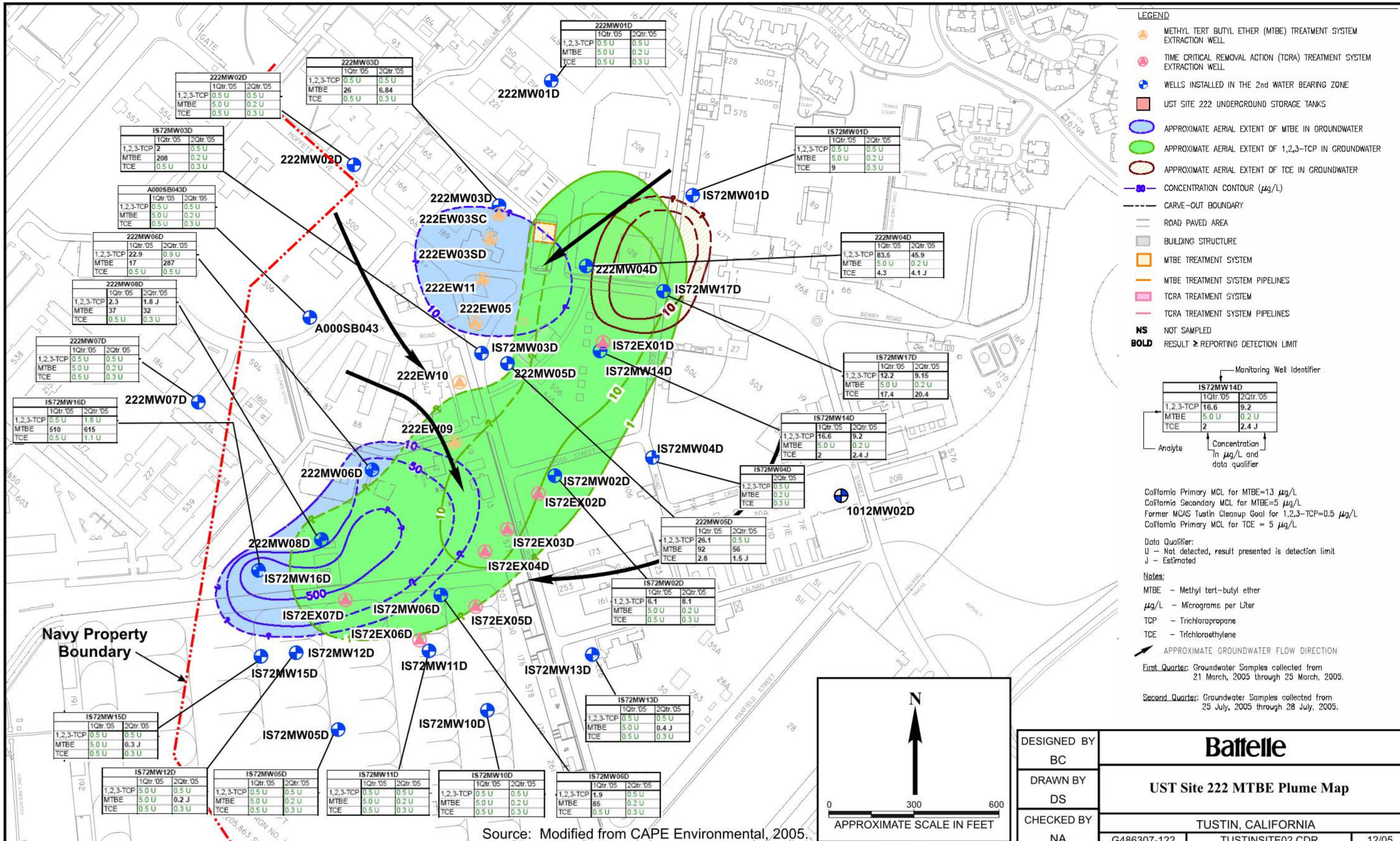

Figure 2-1. UST Site 222 MTBE Plume Map

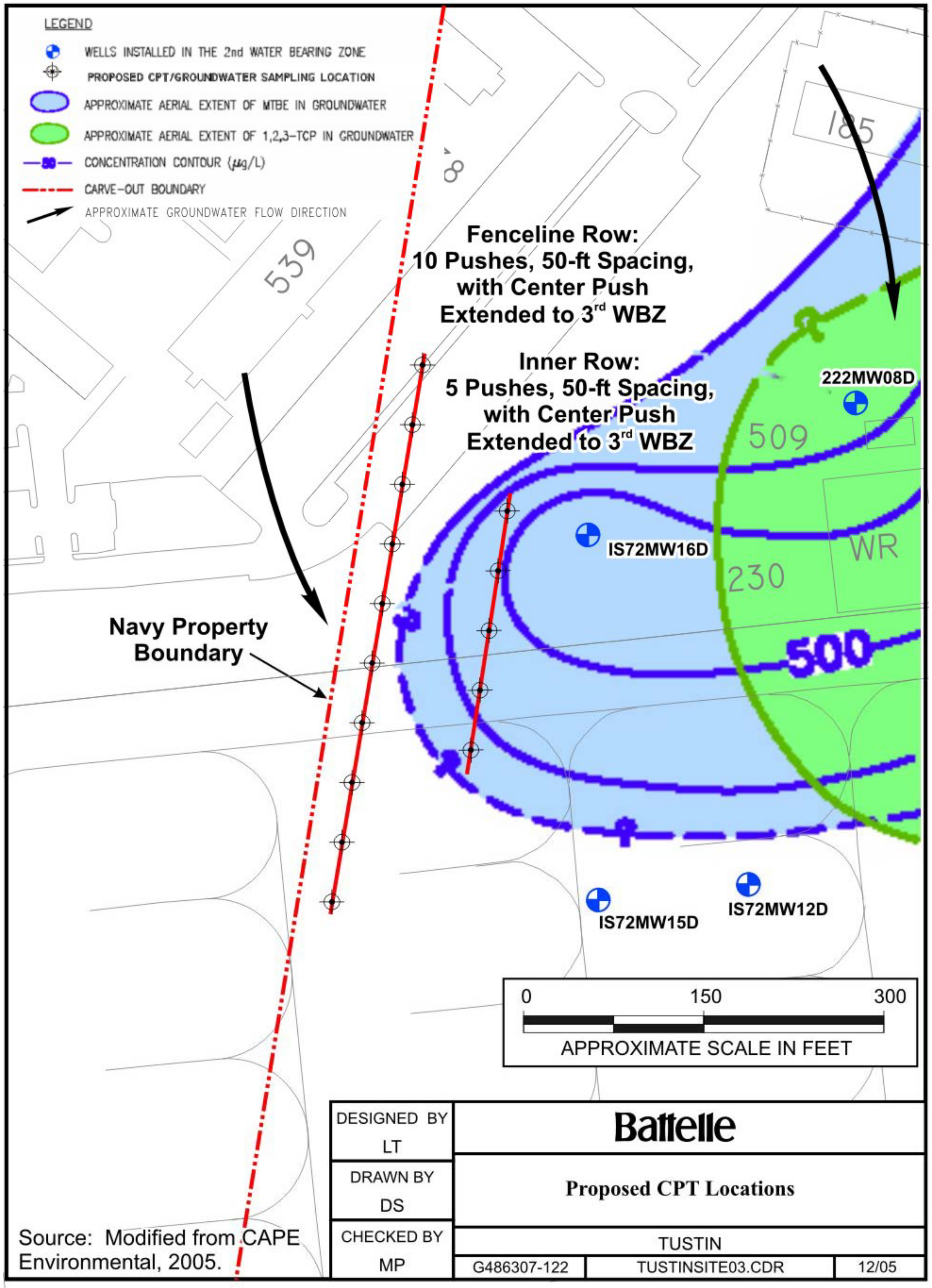

Figure 2-2. Proposed CPT and Groundwater Sampling Locations

The groundwater samples will be sent to a California-certified and Navy-approved laboratory to be analyzed by EPA Method 8260 for VOCs, including MTBE. The sample analysis methods, preservation requirements, sample containers and holding times are indicated in Table 2-1.

Waste characterization samples will be collected from the liquid IDW generated during the delineation activities. The delineation activities will result in aqueous wastes from the decontamination of the sampling equipment. Analytical results of the IDW samples will be reviewed to determine transportation and disposal options for the waste.

2.2 Sampling Methods (B2)

This SAP has been prepared to ensure that the DQOs specified for this project are met, the field sampling protocols are implemented, documented, and reviewed in a consistent manner, and the data collected are scientifically valid and defensible. Battelle personnel will lead the field sampling activities.

This section is divided into the following three sections in order to address the sampling and analytical requirements for the major project elements:

- CPT boring with hydropunch or similar groundwater sampling procedures
- IDW
- Decontamination procedures.

2.2.1 CPT Boring with Hydropunch Groundwater Sampling Procedures. In the CPT process, geotechnical and geophysical characteristics are determined as a cone penetrometer is driven into the subsurface. The CPT probe is advanced into the ground at a rate of 2 centimeters per second, transmitting downhole information to a computer through electronic signals conveyed by cable from sensors located on the probe. The cone penetrometer is equipped with three sensors: tip resistance, sleeve friction, and pore pressure. The tip resistance measures the resistance of the formation to the penetration of the cone tip. The sleeve friction measures the surface friction of the formation as the probe sleeve is advanced beyond it. The pore pressure sensor measures the induced pore pressure resulting from the advancement of the probe. Tip resistance and sleeve friction together are used to characterize the lithology. Pore pressure helps to identify the saturation level of the formation being penetrated.

The CPT system may be utilized in conjunction with conventional direct-push sampling for the collection of groundwater samples. Alternately, groundwater samples may be collected using a Hydropunch™ sampler or similiar. The sampler consists of a stainless steel well point and sample barrel assembly. The well point prevents contamination of the sampler and, when retracted, a 500-milliliter (mL) sample is collected in the sample barrel. After collection, the sampler is brought back up to the surface for transfer to laboratory containers. The sampler is then decontaminated and returned downhole.

2.2.2 Investigation-Derived Wastes. IDW will be produced during the site investigation. The delineation effort will produce various types of IDW, including decontamination water, disposable personal protective equipment (PPE), concrete cores and sampling equipment. As IDW is generated, it will be classified, labeled, managed, and disposed of in accordance with United States Environmental Protection Agency (U.S.EPA) guidance, and all applicable State and federal regulations.

2.2.2.1 Solid Waste. If, based on the best professional judgment of the field manager, the PPE and disposable sampling equipment can be rendered non-hazardous after decontamination procedures, such equipment and PPE will be collected in double plastic bags and disposed off site as municipal waste.

Waste that is potentially contaminated will be stored in drums, labeled, and disposed of as hazardous waste.

2.2.2.2 Liquid Waste. The decontamination activities will produce wastewater, which will be stored temporarily in an appropriate container. The wastewater will be sampled and analyzed prior to disposal. If wastewater samples are determined to be hazardous, Battelle will arrange for the disposal of the wastewater at an appropriate hazardous waste disposal facility with proper manifestation prior to leaving Former MCAS Tustin. If the analyses indicate no presence of hazardous compounds, Battelle will coordinate with the RPM and Navy Resident Officer in Charge of Construction to arrange for disposal of the wastewater.

Liquid waste for waste characterization will be collected using disposable bailers. The samples will be collected in new, precleaned bottles with the appropriate preservative provided by the analytical laboratory. The samples will be labeled and packaged for laboratory submittal. The following summarizes the sampling procedure to be used:

1. Obtain a disposable bailer. A new bailer shall be obtained for each sample event.
2. Put on new, clean, and chemical-resistant disposable gloves.
3. Secure bailer with nylon cord.
4. Lower bailer into the 55-gallon drum or other appropriate container. Allow sufficient time for the bailer to fill with water.
5. Retrieve bailer and fill appropriate bottles for analyses being requested.
6. Cap the bottles and wipe any moisture from outside the bottles.
7. Place a sample label, completed with the sample information, on bottle.
8. Place sample bottle in a cooler with ice for shipment to the analytical laboratory.

2.2.3 Decontamination Procedures. Decontamination will be a four-step process completed on all field equipment to avoid cross contamination between samples and to ensure the health and safety of field personnel. Decontamination water will be collected and disposed of off-site. The following sequence will be used to clean equipment and sampling devices prior to and between each use:

1. Rinse with potable water.
2. Wash with Liquinox™ detergent and tap water and clean with a stiff-bristle brush.
3. Rinse with deionized (DI) water.
4. Rinse with reagent-grade methanol.
5. Place the sampling equipment on a clean surface and air-dry.

2.3 Sample Handling and Custody (B3)

This section presents sample handling and custody procedures. These procedures will ensure proper handling, custody, and documentation of the samples from field collection through laboraotry analyses.

2.3.1 Sample Containers, Preservation, and Holding Time. Requirements for sample containers, preservation, and holding times are listed in Table 2-1. New, precleaned sample containers will be used for water sample collection. Once collected, each sample will be labeled and placed into a cooler. The sample cooler will serve as the shipping container and will be packed with ice to cool samples to the appropriate temperature for preservation and shipment to the analytical laboratory.

2.3.2 Sample Numbering. Each sample collected will be given a unique sample ID. The sample identification (ID) is project specific and a record of all sample IDs will be kept with the field records and recorded on a chain of custody form.

The labeling scheme for sample identification will be as follows: XXX-YY-ZZZZ-AAA. In this scheme, the first three entries (XXX) represent the sampling location, the (YY) entry represents the depth of the sample, the (ZZZZ) entry represents the date the sample was collected, and the (AAA) entries are modifiers that can be used to reflect a quality control sample, for example.

2.3.3 Sample Labeling. Each sample collected for a project will have a sample label affixed to the outside of the container in an obvious location. All information will be recorded on the label with water-resistant ink. The exact sample label information will be project specific but should include the sample identification number, date and time of sample, sampler's name or initials, preservation used, analytical methods, and project or site name.

2.3.4 Sample Custody. All samples collected under this Task Order will be logged onto a chain-of-custody form in the field prior to shipment or pickup by the laboratory. The chain-of-custody form will be signed by the individual responsible for custody of the sample containers, and the original will accompany the samples to the laboratory. One copy of the chain-of-custody form will be kept by the project manager and included in the project files. Information to be recorded on the chain-of-custody form should include:

- Sample matrix
- Sample collector's name
- Dates/times of sample collection
- Sample identification numbers
- Number and type of containers for each sample aliquot
- Type of preservation
- QC sample designation
- Analysis method
- Special handling instructions
- Destination of samples
- Name, date, time, and signature of each individual releasing the shipping container.

Table 2-1. Analysis Method, Sample Container, Preservation and Holding Times for Groundwater Samples

Method	Parameters	Preservation	Container	Holding Time
EPA SW-846 5030B/8260B[(a)]	VOCs	pH<2, 1:1 HCl, Cool, 4 ± 2 ° C	3 x 40 mL VOA	14 days

(a) Note: zero headspace (no air bubbles) is required for this method.

The laboratory will designate a sample custodian. This individual is responsible for inspecting and verifying the correctness of the chain-of-custody records upon sample receipt. The sample custodian will accept the samples by signing the chain-of-custody form and noting the condition of the samples in the space provided on the chain-of-custody form or other receipt form. The sample custodian will notify the Project Team Leader of any discrepancies. The chain-of-custody is generally considered to be a legal document and thus will be filled out legibly and as error free as possible.

Samples received by the laboratory will be entered into a sample management system, which must include:

- Laboratory sample number
- Field sample designation
- Analytical batch numbers
- List of analyses requested for each sample container.

Immediately after receipt, the samples will be stored in an appropriate secure storage area. The laboratory will maintain custody of the samples as required by the contract or until further notification by the Battelle Project Manager. The analytical laboratory will maintain written records showing the chronology of sample handling during the analysis process by various individuals at the laboratory.

2.3.5 Sample Packing and Shipment. Water samples will be placed in a matrix-specific ice chest or cooler. The samples will be packed with shock-absorbent materials, such as bubble wrap, to prevent movement or breakage of the sample bottles during transport. The ice chest will be filled with wet ice in resealable bags in order to meet the preservative requirements ($4 \pm 2°C$). A temperature blank will accompany each cooler. Sample cooler drain spouts will be taped from the inside and outside of the cooler to prevent any leakage.

The chain-of-custody will be placed in a resealable bag and taped to the lid of the cooler. The ice chest will be banded with packaging tape and custody seals will be placed along the ice chest lid in order to prevent or indicate tampering. The cooler containing the environmental samples will either be picked up by the laboratory or arrangements will be made to have the cooler delivered to the laboratory by an overnight delivery service such as Federal Express. International Air Transportation Association (IATA) regulations will be adhered to when shipping samples by air courier services. If an overnight delivery service is used, the package must be scheduled for priority overnight service to ensure that the temperature preservative requirement is not exceeded. Saturday deliveries will be coordinated with the laboratory.

2.3.6 Field Documents and Records. A project-specific field logbook will be used to provide daily records of significant events, observations, and measurements during field investigations. The field logbook also will be used to document all sampling activities. All logbook entries will be made with indelible ink to provide a permanent record. Logbooks will be kept in the possession of the field team leader during the on-site work and all members of the field team will have access to the notebook. These notebooks will be maintained as permanent records. Any errors found in the logbook will be verified, crossed-through, and initialed by the person discovering the error.

The field notebooks are intended to provide sufficient data and observations to reconstruct events that occurred during field activities. Field logbooks should be permanently bound and prepaginated; designated forms should be used whenever possible to ensure that field records are complete. The following items are examples of information that may be included in a field logbook:

- Name, date, and time of entry

- Names and responsibilities of field crew members
- Name and titles of any site visitors
- Descriptions of field procedures, and problems encountered
- Number and amount of samples taken at each location
- Details of sampling location, including sampling coordinates
- Sample identification numbers of all samples collected
- Date and time of collection
- Sample collector
- Sample collection method
- Decontamination procedures
- Field instrument calibration and maintenance; and
- Field measurements and general observations.

2.4 Analytical Methods (B4)

This section presents criteria for laboratory selection and discusses methods to be used for analyses of groundwater and IDW samples.

2.4.1 Laboratory Selection. An analytical laboratory that has successfully completed the Navy evaluation process through the Naval Facilities Engineering Service Center (NFESC) will perform all analyses, unless specified otherwise by the Navy. Aqueous samples for this task order will be analyzed by EMAX Laboratories, a California Department of Health Services (DHS)-certified and NFESC-approved laboratory using approved methods.

Battelle's Project Manager will communicate sampling and analysis schedules to the laboratory with sufficient lead time to meet contractual agreements with the laboratory.

2.4.2 Laboratory Analytical Methods. Laboratory analytical methods were selected based on the project DQOs and in consideration of the method detection limits (MDLs) achievable for each parameter. Each laboratory analytical method was chosen to address the intended use of the sampling data. Table 2-2 presents the laboratory analytical methods that are to be used.

2.4.3 Quantitative Reporting Limits. Factors that influence the quantitative reporting limits of analytical methods include the analytical method itself, sample matrix interference, and high concentrations of the target analyte. Actual reporting limits may vary from sample to sample in accordance with standard laboratory practices. Table 2-2 provides the MDLs and reporting limits for the analytical methods used for the groundwater analyses.

Table 2-2. Analytical Laboratory Method Detection and Reporting Limits for Groundwater Samples

Analytical Parameter	Method Detection Limit (MDL) µg/L	Reporting Limit (RL) µg/L	Action Level µg/L
VOCs – EPA SW-846 8260B			
1,1,1,2-Tetrachloroethane	1	5	NA
1,1,1-Trichloroethane	1	5	NA
1,1,2,2-Tetrachloroethane	1	5	NA
1,1,2-Trichloroethane	1	5	NA
1,1-Dichloroethane	1	5	NA
1,1-Dichloroethene	1	5	NA
1,1-Dichloropropene	1	5	NA

Table 2-2. Analytical Laboratory Method Detection and Reporting Limits for Groundwater Samples (Continued)

Analytical Parameter	Method Detection Limit MDL µg/L	Reporting Limit RL µg/L	Action Level µg/L
VOCs - EPA SW-846 8260B			
1,2,3-Trichlorobenzene	1	5	NA
1,2,3-Trichloropropane	0.5	0.5	NA
1,2,4-Trichlorobenzene	1	5	NA
1,2,4-Trimethylbenzene	1	5	NA
1,2-Dibromo-3-Chloropropane	2	10	NA
1,2-Dichlorobenzene	1	5	NA
1,2-Dichloroethane	1	5	NA
1,2 Dichlorpropane	1	5	NA
1,2 Dibromoethane	1	5	NA
1,3,5-Trimethylbenzene	1	5	NA
1,3-Dichlorobenzene	1	5	NA
1,3-Dichloropropane	1	5	NA
1,4-Dichlorobenzene	1	5	NA
1-Chlorohexane	1	5	NA
2,2-Dichloropropane	1	5	NA
2-Chlorotoluene	1	5	NA
4-Chlorotoluene	1	5	NA
Benzene	1	5	NA
Bromobenzene	1	5	NA
Bromochloromethane	1	5	NA
Bromodichloromethane	1	5	NA
Bromoform	1	5	NA
Bromomethane	1	10	NA
Carbon tetrachloride	1	5	NA
Chlorobenzene	1	5	NA
Chloroethane	1	5	NA
Chloroform	1	5	NA
Chloromethane	1	5	NA
cis-1,2-Dichloroethene	1	5	NA
cis-1,3-Dichloropropene	1	5	NA
Dibromochloromethane	1	5	NA
Dibromomethane	1	5	NA
Dichlorodifluoromethane	1	5	NA
Ethylbenzene	1	5	NA
Hexachlorobutadiene	1	5	NA
Isopropylbenzene	1	5	NA
m,p-Xylene	2	10	NA
Methylene Chloride	1	10	NA
n-Butylbenzene	1	5	NA
n-Propylbenzene	1	5	NA
Naphthalene	1	5	NA
o-Xylene	1	5	NA
p-Isopropyltoluene	1	5	NA
sec-Butylbenzene	1	5	NA
Styrene	1	5	NA
tert-Butylbenzene	1	5	NA
Tetrachloroethene	1	5	NA
Toluene	1	5	NA
trans-1,2-Dichloroethene	1	5	NA
trans-1,3-Dichloropropene	1	5	NA
Trichloroethene (TCE)	1	5	NA
Trichlorofluoromethane	1	5	NA

Table 2-2. Analytical Laboratory Method Detection and Reporting Limits for Groundwater Samples (Continued)

Analytical Parameter	Method Detection Limit MDL µg/L	Reporting Limit RL µg/L	Action Level µg/L
VOCs – EPA SW-846 8260B			
Vinyl chloride	1	5	NA
Acetone	5	10	NA
2-Butanone (MEK)	5	10	NA
Methyl-*tert*-butyl ether (MTBE)	1	5	13
Tertiary butyl alcohol (TBA)	5	20	NA

RL: Reporting limit.
MDL: Method detection limit
NA: not applicable

2.5 Quality Control Requirements (B5)

QA is an integrated system of activities in the area of quality planning, assessment, and improvement to provide the project with a measurable assurance that the established standards of quality are met. QC checks, including both field and laboratory, are specific operational techniques and activities used to fulfill the QA requirements.

2.5.1 Field Quality Control. The field QC samples will be assigned unique sample numbers and will be submitted to the analytical laboratory. If abnormalities are detected in field QC samples, the data associated with the QC samples will be flagged and appropriate actions will be taken to rectify issues.

Field Duplicate Samples. Field duplicate/replicate samples will be collected at a rate of 10% of the total number of samples. If fewer than 10 samples are collected, one duplicate sample will be collected. For all water samples, duplicate samples will be collected by retaining consecutive samples from the sampling device. Field duplicates give an indication of the variability in contaminant distribution within the matrix sampled. Field duplicates are collected immediately after the primary sample from the same source and using the same collection methods. Field duplicates are treated identically to all other primary field samples in terms of collection, preservation, shipping, and analysis.

Equipment Rinsate Blanks. Equipment rinsate blanks will be collected daily to ensure that nondedicated sampling devices have been decontaminated effectively. Equipment rinsate blanks will consist of the rinsewater used in the final step of the sampling equipment decontamination procedure. Rinsate samples will be collected at a frequency of one per day during sampling events. Rinsate samples may be collected more frequently if required to meet the project DQOs.

Trip Blanks. Trip blank samples will accompany each cooler that contains samples being submitted for volatile organic compound (VOC) analysis. Trip blanks will be prepared by the analytical laboratory filling volatile organic analysis (VOA) vials with DI water. Trip blanks are not to be opened in the field. Trip blanks will be analyzed for VOCs only if they are detected in actual associated site samples. Trip blanks indicate whether the field samples have been contaminated during storage and shipping. The results of the trip blank analysis will be used to evaluate the field sample data in a manner consistent with the project DQOs.

Source Blanks. Source blanks are collected to ensure that water used during decontamination is not a source of contamination. Source blank samples will be collected at a frequency of one for each source of water used for equipment rinsate blanks. If the source for decontamination water changes, additional source blank samples will be collected. To prepare source blanks, the VOA vials will be filled with source water at the same time that it is used for decontamination. Source blanks will be analyzed by the laboratory for VOCs only if VOCs are detected in actual groundwater samples.

Temperature Blank. Temperature blank samples will accompany each cooler that contains samples with a temperature preservative requirement. The temperature blank will be prepared by the analytical laboratory by filling VOA vials with DI water. The temperature of the samples will be verified upon arrival at the analytical laboratory using the temperature blank.

2.5.2 Laboratory Quality Control. Laboratory QC is addressed through the analysis of laboratory QC samples, documented internal and external laboratory QC practices, and laboratory audits. The types of laboratory QC samples will be project/chemical specific, but may include laboratory control samples, laboratory duplicates, matrix spikes (MSs), surrogate standards, internal standards, method blanks, instrument blanks, and postdigestion spikes. MSs, matrix spike duplicates (MSDs), and LCS are analyzed for every batch of up to 20 samples and serve as a measure of analytical accuracy. Surrogate standards are added to all samples, blanks, MSs, MSDs, and LCSs which are analyzed for organic compounds in order to evaluate the method's accuracy and to help determine matrix interferences.

Definitions of each type of laboratory QC sample are listed in the following subsections. For laboratory measurements, if any of the QC checks are outside the acceptance criteria, corrective actions will be taken. The laboratory QC checks, acceptance criteria, and corrective actions are listed in Table 2-3. Precision and accuracy requirements for LCS/laboratory control standard duplicate (LCSD) and MS/MSD samples are presented in Table 2-4.

Laboratory QC procedures will be in accordance with the latest version of the Navy Installation Restoration Chemical Data Quality Manual (IRCDQM) (U.S. Navy, 1999).

Table 2-3. Quality Control, Acceptance Criteria, and Corrective Action

QC Sample Type	Acceptance Criteria	Corrective Action
Procedural blank	$<5 \times$ MDL	Results examined by analyst. Corrective action (re-extraction, reanalysis) or justification document.
Blank spike	80-120%	
Calibration	5-point calibration curve (RSD ≤ ± 20%); mid-range NIST standard solution (RSD≤ ± 20%)	Investigate the problem, resolve the problem, and recalibrate.
Calibration check	Mid-range calibration solution (RSD ≤ ± 30%) (every 10 samples)	Investigate the problem, resolve the problem, recalibrate, and reanalyze affected samples.

MDL = Method detection limit is estimated from the lowest calibration standard solution. Samples below the MDL will be reported as not detected (ND).
NIST = National Institute of Standards and Technology.
RSD = Relative Standard Deviation.
SOP = Standard Operating Procedure.

Table 2-4. Analyte List, Precision and Accuracy for Groundwater Samples

Analytical Parameter	Precision (% RPD)	Accuracy MS/MSD (% Recovery)	Accuracy LCS/LCSD (% Recovery)
VOCs - EPA SW-846 Method 8260B			
1,1,1,2-Tetrachloroethane	30	70-130	63-143
1,1,1-Trichloroethane	30	70-130	63-143
1,1,2,2-Tetrachloroethane	30	60-140	54-154
1,1,2-Trichloroethane	30	70-130	63-143
1,1-Dichloroethane	30	70-120	63-132
1,1-Dichloroethene	30	60-130	54-143
1,1-Dichloropropene	30	70-130	63-143
1,2,3-Trichlorobenzene	30	60-140	54-154
1,2,3-Trichloropropane	30	60-140	54-154
1,2,4-Trichlorobenzene	30	60-140	54-154
1,2,4-Trimethylbenzene	30	70-130	63-143
1,2-Dibromo-3-Chloropropane	30	70-130	63-143
1,2-Dichlorobenzene	30	70-120	63-132
1,2-Dichloroethane	30	70-130	63-143
1,2 Dichlorpropane	30	70-130	63-143
1,2 Dibromoethane	30	70-130	63-143
1,3,5-Trimethylbenzene	30	70-130	63-143
1,3-Dichlorobenzene	30	70-130	63-143
1,3-Dichloropropane	30	70-130	63-143
1,4-Dichlorobenzene	30	70-120	63-132
1-Chlorohexane	30	70-130	63-143
2,2-Dichloropropane	30	60-130	54-143
2-Chlorotoluene	30	70-130	63-143
4-Chlorotoluene	30	70-130	63-143
Benzene	30	70-130	63-143
Bromobenzene	30	70-130	63-143
Bromochloromethane	30	70-130	63-143
Bromodichloromethane	30	70-130	63-143
Bromoform	30	70-140	63-154
Bromomethane	30	50-140	45-154
Carbon tetrachloride	30	70-130	63-143
Chlorobenzene	30	70-120	63-132
Chloroethane	30	60-140	54-154
Chloroform	30	70-120	63-132
Chloromethane	30	50-130	45-143
cis-1,2-Dichloroethene	30	70-130	63-143
cis-1,3-Dichloropropene	30	70-130	63-143
Dibromochloromethane	30	70-130	63-143
Dibromomethane	30	70-130	63-143
Dichlorodifluoromethane	30	40-130	36-143
Ethylbenzene	30	70-120	63-132
Hexachlorobutadiene	30	50-140	45-154
Isopropylbenzene	30	70-140	63-154
m,p-Xylene	30	70-130	63-143
Methylene Chloride	30	60-120	54-132
n-Butylbenzene	30	70-130	63-143
n-Propylbenzene	30	70-130	63-143
Naphthalene	30	60-140	54-154
o-Xylene	30	70-130	63-143

Table 2-4. Analyte List, Precision and Accuracy for Groundwater Samples (Continued)

Analytical Parameter	Precision (% RPD)	Accuracy MS/MSD (% Recovery)	Accuracy LCS/LCSD (% Recovery)
VOCs - EPA SW-846 Method 8260B			
p-Isopropyltoluene	30	70-130	63-143
sec-Butylbenzene	30	70-130	63-143
Styrene	30	70-130	63-143
tert-Butylbenzene	30	70-130	63-143
Tetrachloroethene	30	70-130	63-143
Toluene	30	70-130	63-143
trans-1,2-Dichloroethene	30	70-130	63-143
trans-1,3-Dichloropropene	30	70-140	63-154
Trichloroethene (TCE)	30	70-130	63-143
Trichlorofluoromethane	30	60-140	54-154
Vinyl chloride	30	60-140	54-154
Acetone	30	50-150	45-165
2-Butanone (MEK)	30	60-150	54-165
Methyl-*tert*-butyl ether (MTBE)	30	60-140	54-154
Tertiary butyl alcohol (TBA)	30	60-140	54-154

Laboratory Control Samples. Laboratory control samples include blank spikes and blank spike duplicates. Blank spike samples are designed to check the accuracy of the laboratory analytical procedures by measuring a known concentration of an analyte in the blank spike samples. Blank spike duplicate samples are designed to check laboratory accuracy and precision of the analytical procedures by measuring a known concentration of an analyte in the blank spike duplicate sample. Blank spike and blank spike duplicate samples are prepared by the laboratory using clean laboratory matrices spiked with the same spiking compounds used for matrix spikes at levels approximately 10 times greater than the MDL.

Laboratory Duplicates. Laboratory duplicates are two aliquots of a sample taken from the same sample container under laboratory conditions and analyzed independently. The analysis of laboratory duplicates allows the laboratory to measure the precision associated with laboratory procedures.

Matrix Spikes. MS and MSD samples are designed to check the precision and accuracy of the analytical methods through the analysis of a field sample with a known amount of analyte added. Additional sample volume for MS and MSD samples is collected in the field in the same manner as field duplicate samples. In the laboratory, two portions of the sample are spiked with a standard solution of target analytes. MS and MSD samples are analyzed for the same parameters as the field samples, and analytical results will be evaluated for precision and accuracy of the laboratory process and effects of the sample matrix. The number of MSs and MSDs collected from the field samples will be project/chemical dependent. A minimum of one MS/MSD will be analyzed each day that field samples are analyzed at a rate of 1 per 20 field samples or 1 per batch, whichever if more frequent.

Surrogate Standards. Surrogates are chemical compounds with properties that mimic analytes of interest, but that are unlikely to be found in environmental samples. Surrogates will be added to all field and quality control samples analyzed for volatiles, analyzed by gas chromatography (GC) or GC/mass spectrometry to assess the recovery of the laboratory process, and to detect QC problems.

Internal Standards. Like the surrogate standard, an internal standard is a chemical compound unlikely to be found in environmental samples that is added as a reference compound for sample quantification. Internal standard procedures are used for the analysis of volatile organics and extractable organics using gas chromatography/mass spectrometry (GC/MS) and can also be used for other GC and high-performance liquid chromatography (HPLC) analytical methods.

Method Blanks. Method blanks are designed to detect contamination of field samples that may occur in the laboratory. Method blanks verify that method interference caused by contaminants in solvents, reagents, glassware, and other sample processing hardware are known and minimized. Method blanks are deionized water for aqueous samples, a clean solid matrix for soil and sediment, and clean filters or puffs for vapor and air samples. A minimum of one method blank will be analyzed each day that field samples are analyzed at the rate of 1 per 20 field samples. A method blank must be analyzed daily. The concentration of the target compounds in the method blank sample must be less than five times the MDL. If the blank is not under the specified limit, the source contamination is to be identified and corrective actions taken.

2.6 Instrument/Equipment Testing, Inspection and Maintenance (B6)

Field instruments may be used during the field activities at Former MCAS Tustin. Such instrumentation may include a water level indicator for measuring water levels in nearby wells.

Field instrument maintenance will be documented in the field logbook for each field instrument used during field activities. Field equipment will be maintained when routine inspections indicate the need for maintenance. In the event that a piece of equipment needs repair, a list of the field equipment manufacturers' addresses, telephone numbers, and points of contact will be maintained on site during field activities. Field equipment routine maintenance may include the following:

- Calibrating equipment according to manufacturers' directions
- Removing surface dirt and debris
- Replacing/cleaning filters when needed
- Ensuring proper storage of equipment
- Inspecting instruments prior to use
- Charging battery packs when not in use
- Maintaining spare and replacement parts in the field to minimize downtime.

The primary objective of a preventive maintenance program is to help ensure the timely and effective completion of a measurement effort by minimizing the downtime of crucial analytical equipment due to expected or unexpected component failure. Laboratory instrument maintenance including standard preventive maintenance procedures and schedules are contained in, and will be performed in accordance with, the Laboratory Quality Assurance Plan (LQAP) and the manufacturer's instructions. Instruments will be constantly monitored by the use of daily standards, sensitivity, and response checks to determine if maintenance is required.

2.7 Instrument/Equipment Calibration and Frequency (B7)

Methods for calibration of field instruments will follow the specific instrument manufacturer's recommendations. All field instruments will be calibrated before each day of use; and a calibration check at the end of the day will be performed to verify that the instrument remained in good working condition throughout the day. If the calibration check at the end of the day does not meet acceptance criteria, then that day's data will be flagged and the instrument calibration checks will increase to the operator's satisfaction that the instrument remains true to the initial calibration.

Laboratory instrument calibration will be performed as specified in the method documentation. Specific laboratory calibration techniques are established for the U.S. EPA methods to demonstrate that the analytical instrument is operating within the design specifications and that the quality of the data generated can be replicated.

2.8 Inspection/Acceptance of Supplies and Consumables (B8)

Any supplies and consumables used in the sample collection process or instrument calibration, such as sample bottles, bailers, deionized water, etc., will be inspected upon receipt and prior to use. The sample tubing should also come with a certificate of acceptance. At a minimum, the Project Manager or a field team member will inspect the materials upon receipt for damage or broken seals.

The laboratories chosen to perform the analyses will be required to purchase and/or provide equipment, materials, and supplies that meet or exceed the requirements of the project and/or analytical methods. The laboratories will inspect their supplies and consumables prior to their use in analysis.

2.9 Nondirect Measurements (B9)

Nondirect measurement data are not anticipated as part of the field implementation or field decision-making aspects of this project.

2.10 Data Management (B10)

The purpose of the data management section of this SAP is to describe the procedures that will be used to maintain data quality throughout the project. These operations include, but may not be limited to, data recording, data reduction, and data reporting.

2.10.1 Data Recording. All field observations and laboratory results will be linked to a unique sample location through the use of the sample identification system. Field observations and measurement data will be recorded on the field forms and in a field notebook to provide a permanent record of field activities. A check for completeness of field records (logbooks, field forms, databases, electronic spreadsheets) will ensure that all requirements for field activities have been fulfilled, complete records exist for each activity, and the procedures specified in this SAP have been implemented. Field documentation will ensure sample integrity and provide sufficient technical information to recreate each field event.

2.10.2 Data Reduction. The data reduction procedures applied to reported data must be fully documented as follows:

- U.S. EPA Method: data are generated and final concentrations are calculated exactly as specified in the method.
- Laboratory LQAP or Standard Operating Procedure (SOP): The laboratory procedures, consistent with the U.S. EPA or other established methods, are fully documented in the laboratory's controlling records.
- SAP: If an unusual calculation is applied to the data and it is not documented in either the established method or the laboratory's standard procedure, then the full dimensional formula must be defined in the SAP.

2.10.3 Data Reporting. Hard copies of the data reports received from the laboratories will be filed chronologically in binders and will be stored separately from the electronic files. Hard copies of data signed by a representative of the analytical laboratory will be compared to any electronic versions of the data to confirm that the conversion process has not modified the reported results.

2.10.4 Electronic Deliverables. Following the data review process, Battelle will enter the sample results into an electronic database. This electronic database will be submitted to Naval Facilities Engineering Command Southwest (NAVFAC Southwest) in Naval Electronic Data Deliverable (NEDD) format and entered into the Navy Installation Restoration Information System (NIRIS) as described in current Environmental Work Instruction #6 (Environmental Data Management and Required Electronic Delivery Standards). If required, data will also be submitted electronically to the California State Water Resources Control Board (SWRCB) using the Geographical Environmental Information Management System (GeoTracker) in accordance with Assembly Bill (AB) 2886. Data will be compiled with spatial and temporal qualifiers so that it will be possible to rapidly plot or review changes in the concentration of target analytes at each sampling point over time.

SECTION 3.0: ASSESSMENT/OVERSIGHT

This section describes the activities for assessing the effectiveness of the project implementation and associated QA and QC activities. The purpose of assessment is to ensure that the SAP is implemented as prescribed.

3.1 Assessments and Response Actions (C1)

Assessments that may be performed during this project include, but are not limited to, the following: technical system audits, audits of data quality, and data quality assessments.

3.1.1 Laboratory Assessment and Oversight. Technical Systems Audits (TSAs) of the analytical laboratories will be conducted by the Battelle Program QC Manager if required to assess compliance with QA procedures and SOPs. Results of the TSAs will be reported in an audit report to the laboratory manager. Technical systems audits and audits of data quality will be conducted periodically during remedial activities by the Battelle Program QC Manager. In addition, the Battelle Project Manager/ Program QC Manager will conduct regular audits of the field and laboratory data as they are generated as well as data/sample collection procedures. This schedule of QA checks will require the cooperation of the laboratory regarding timely delivery of reports. However, it will ensure that data quality issues are identified early, rather than at the end of the investigation.

If significant variances are found during the audit, the Battelle Program QC Manager may, at his or her discretion, conduct additional audits. Additional audits may include a visit to the laboratory, if required and if determined to be necessary by the Battelle Program QC Manager. For those audits resulting in variances, the Project Team Leader or the laboratory coordinator will submit a response in writing to the Battelle Program QC Manager. Reports will be submitted to NAVFAC Southwest through the RPM.

The analytical laboratory will participate in the U.S. EPA performance evaluation (PE) program, the National Environmental Laboratory Accreditation Conference (NELAC), and equivalent programs for state certifications. Satisfactory performance in these PE programs also demonstrates proficiency in methods used to analyze project samples. If the laboratory's performance is determined to be unacceptable on any individual portion of the PE evaluation, then corrective actions will be taken to locate the problem, identify the problem, implement corrective actions, and to document these corrective actions. Once the problem has been identified and the corrective action implemented, the laboratory will purchase a blind, PE sample and analyze it for that portion of the evaluation.

3.1.2 Data Quality Assessment Report. Data collected during the field efforts will be reconciled with the project DQOs by preparing summary tables, charts, and figures, or performing other types of data analyses that facilitate direct comparison of data collected through the entire extent of the project. Comparisons will be made on a parameter-specific basis, concentrating on the contaminants of concern. Comparisons also will facilitate an analysis of contaminant concentration trends through time and space.

3.1.3 Corrective Action. Corrective actions may be initiated by any of the participants of the data generation (field technician or laboratory analyst), reporting (laboratory director or field team leader), and validation process (Battelle Project Manager or Program QC Manager). Note that it is important to generate corrective actions early in the process so that the problem has a greater chance of being resolved in a timely and cost-effective manner.

3.2 Reports to Management (C2)

Project reports prepared by Battelle will be submitted to NAVFAC Southwest through the RPM. The schedule and additional recipient list for submission of these reports following completion of sampling will be decided accordingly.

Section 4.0: DATA VALIDATION AND USABILITY

This section is divided into three elements that describe the QA activities that occur after the data collection phase of the project has been completed to ensure that data conform to the specified criteria and thus are useful for their intended purpose.

4.1 Data Review, Verification, and Validation (D1)

All project data will be reviewed by Battelle to determine if the qualitative parameters of representativeness and comparability have been achieved. In general, the review will be accomplished by comparing the chain of custody and field notebook entries with the data for the sample. If the reported concentrations of a field sample from a specific location do not reflect historical data, then efforts will be made to determine if the data reflect an actual change in environmental conditions at that sampling point, or if the integrity of the sample was compromised during collection, preservation, shipping, or analysis. Conversely, if some level of analyte historically present in samples from a specific location is no longer present, then similar efforts will be made to confirm that change in concentration. QA/QC requirements that bracket questionable data will be reviewed to confirm the performance of instrumentation during the time when questionable data were generated. Any deviations will be documented, and corrective actions will be taken to determine if the data meet project goals. If the data do not meet project goals, then the need for additional sampling and analysis will be determined.

The laboratory that generates the analytical data will have the primary responsibility for the correctness and completeness of the data. Before releasing any analytical data, the laboratory will review and verify that the data has met all of the method criteria and is scientifically correct. Data reviews include the evaluation of information, as presented by the analyst or staff member, for accurate representation of the samples submitted.

All data will be subjected to a tiered review process before it is released from the laboratory. First, the analysts will review the quality of their work based on established guidelines. This includes reviewing and performing the following activities:

- Calibrations, tunes, blanks, and any other instrument QC criteria were met during the analysis reported
- Calculations of individual analytes and detection limits were met
- Verify that holding times or extraction times were met; and,
- Make notes or footnotes on the report if abnormalities occurred during the analysis or any other QA/QC problems associated with the sample occurred.

The next step is performed by a supervisor or data review specialist whose function is to provide an independent review of data packages. This person will verify that all dates, sample identification, detection limits, reported analyte values, concentration units, header information, and footnotes or comments were transcribed accurately. This person will also check to ensure that data that do not meet project DQOs will be flagged with the appropriate data qualifiers. All information on the final report that can be verified against the chain of custody is checked for errors and completeness.

The third step is done by the Laboratory Director or other designee who will sign the final reports. This person spot-checks activities associated with the log-in, tracking, extraction, sample analysis, and final reporting for technical and scientific soundness.

The Laboratory QA Manager then will review 10% of all data packages to ensure that all QA requirements have been met. This person will ensure that the data package is consistent and complies with project requirements.

4.2 Verification and Validation Methods (D2)

The data generated for a project will be verified by the Battelle Program QC Manager and validated by an independent outside review.

Data verification involves the process of generating qualitative and quantitative sample information through observations, field procedures, analytical measurements and calculations. The data verification and reporting process for the field data involves ensuring that calibration of instruments, field blanks, and field duplicates defined in this SAP are within the acceptance criteria. The verification process for the laboratory data involves ensuring that the holding times, precision, accuracy, laboratory blanks, and detection limits are within the acceptance criteria outlined in the project-specific data quality plan.

The laboratory personnel will provide the Battelle Program QC Manager with all of the data. The data will also be sent to an outside independent review company for data validation. The Battelle Program QC Manager will be responsible for overall review of the data validation results, for compliance with the specified DQOs. After this QC procedure is complete, the Battelle Project Manager will incorporate the verified data into the investigation reports. The data generated for this contract will be validated in accordance with NAVFAC Southwest Environmental Work Instruction #1 (Chemical Data Validation). The data validation strategy is based on whether or not the Naval facility is on the National Priorities List (NPL) and is fully described by the U.S. Navy (2001). Validation at Former MCAS Tustin will be conducted according to the following strategy:

- Non-NPL sites: 10% Level-IV and 90% Level-III data validation is required.

4.2.1 Level-III Data Validation. Level-III data validation assumes that reported data values are correct as reported. Data quality is assessed by verifying that the criteria defined in this SAP have been achieved for each compound class.

4.2.2 Level-IV Data Validation. Level-IV data validation is based on the assessment of raw data packages, which include all data required for a full review and assessment of compound selection, integration, interference assessment, and requantification (e.g., spectra and chromatograms). Supporting records are also included in the package (e.g., calibration standard, instrument sequence files, and dilution factors).

Level-IV data validation includes requantification of reported QC and field sample values using the raw data files. In addition, instrument performance, calibration methods, and calibration standards are reviewed to ensure that the detection limits and data values are accurate and appropriate.

4.3 Reconciliation with Data Quality Objectives (D3)

Data collected during the field efforts will be reconciled with the DQOs by preparing summary tables, charts, and figures, or performing other types of data analyses that facilitate direct comparison of data collected through the entire extent of the project. Comparisons will be made on a parameter-specific basis, concentrating on the contaminants of concern. Comparisons also will facilitate an analysis of contaminant concentration trends through time and space.

Section 5.0: REFERENCES

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